Braider apparatus with improved bobbin holder

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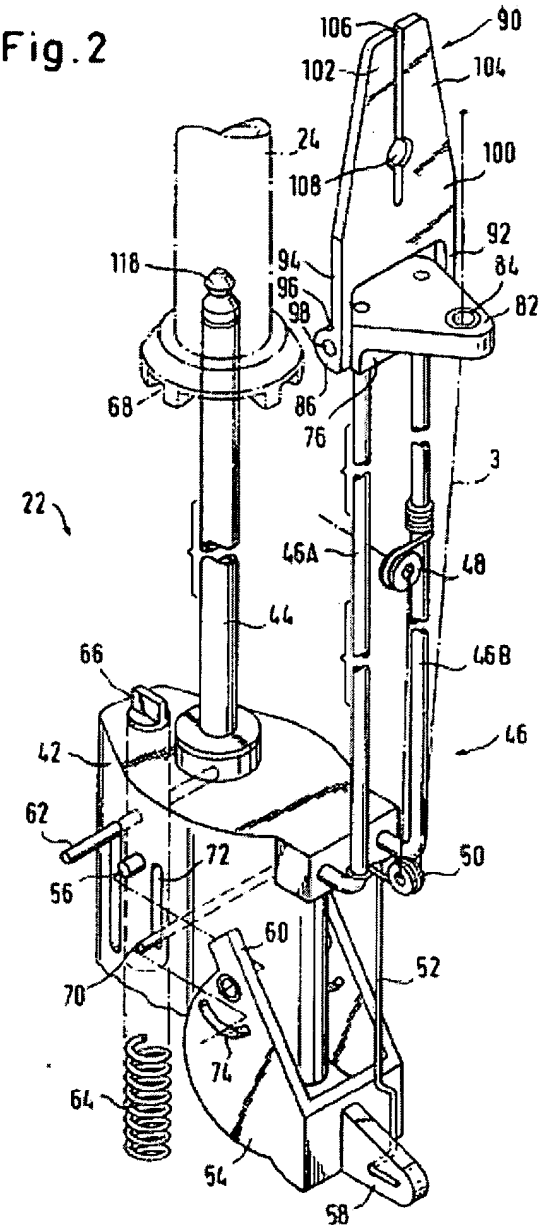
An apparatus is disclosed for braiding fine denier yarns to form a braided suture product which includes a carrier housing 42, a main carrier support plate 18 for guiding a plurality of yarn carriers 22 through predetermined paths while dispensing fine denier yarns toward a braiding zone. Each yarn carrier has a spindle 44 for mounting a molded bobbin, with a spindle tip 118 having a recess 126 engageable with resilient leg portions of a bobbin hold down member 90 hingedly mounted for rotation relative to the carrier housing. Tension on the yarn controls rotational movement of the bobbin to dispense yarn therefrom, and the tension of the final braided suture product is controlled to form a product of predetermined uniform appearance.

Fig.2



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(54) **Braider apparatus with improved bobbin holder**

Flechtmaschine mit verbessertem Klöppel

Machine à tresses avec porte-bobine amélioré

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Description

TECHNICAL FIELD

The present invention relates to a device for braiding fine denier yarns and, more particularly, to an improved braider bobbin top holder particularly suited for use with a device for braiding fine denier yarns to make surgical sutures. A device in accordance with the precharacterising part of claim 1 below is disclosed in CH-A-85215.

BACKGROUND OF THE INVENTION

Braided products and apparatus for production of such products are- well-knows. Typical of the braiding mechanisms used for such products are disclosed in U.S. Patent Nos. 776,842 to Horwood, 1,154,964 to Bentley. 1,285,451 to Stanton, 1,358,173 to Penso et al., 1,486,527 to Larkin, 1,785,683 to Mallory, 2,079,836 to Brown et al., 2,200,323 to Barrans et al., 2,452,136 to Marti, 4,158,984 to Griffiths, 4,304,169 to Cimprich et al., 4,333,380 to Kozlowski, 4,716,807 to Fischer, S,753,149 to Celani, 4,909,127 to Skelton et al. and 4,922,798 to Ivsan. British Patent Publication No. 138,069 dated September 2, 1920 relates to improvements in such braiding devices.

GB-A-836 240 discloses a supply bobbin carrier for a braiding machine which has a bobbin lock unit which includes a wire spring clip with jaws to grip the neck of the bobbin spindle. The lock unit swings on an axis parallel to the spindle.

Sutures intended for the repair of body tissues must meet certain requirements: they must be substantially non-toxic, capable of being readily sterilized, they must have good tensile strength and have acceptable knot-tying and knot-holding characteristics and if the sutures are of the bio-absorbable variety, the bio-absorption of the suture must be closely controlled.

Sutures have been constructed from a wide variety of materials including surgical gut, silk, cotton, polyolefins such as polypropylene, polyamides, polyesters such as polyethylene terephthalate, polyglycolic acid, glycolide-lactide copolymer, etc. Although the optimum structure of a suture is that of a monofilament, since certain materials of construction would provide a stiff monofilament suture lacking acceptable handling, knot-tying and knot-holding properties, sutures manufactured from such materials have been provided as braided structures. Thus, for example, sutures manufactured from silk, polyamide, polyester and bio-absorbable glycolide-lactide copolymer are usually provided as multifilament braids.

Currently available braided suture products are braided on conventional braider apparatus having yarn bobbin carriers which travel around the perimeter of a braider deck to result in a tubular type braid with the yarns crossing over each other on the surface of the braid. In larger suture sizes, e.g., 5/0 and larger, the tubular braid, or sheath, is constructed about a core structure which is fed through the center of the braider. Known tubular braided sutures, including those possessing cores, are disclosed, e.g., in U.S. Patent Nos. 3,187,752; 3,565,077; 4,014,973; 4,043,344; and 4,047,533.

Recent attempts to improve the flexibility, hand and tissue drag characteristics of braided sutures have resulted in new braid structures possessing a significantly greater number of sheath yarns for a given overall denier, the sheath yarns being fabricated from individual filaments of finer denier than filaments which are typical of known types of braided sutures. Braided sutures of this type are disclosed and claimed in U.S. Patent 5,019,093. The foregoing patent discloses sutures braided from yarns having a denier (denier = weight in grams of 9000 m length of the yarn in question) in the range of about 0.2 to 6.0 and, optionally, a core having a denier of from about 50 to about 2500 denier.

SUMMARY OF THE INVENTION

The present invention relates to an improved apparatus for braiding elongate flexible members to form a final braided product, preferably a surgical suture made from fine denier yarns. The braided product may be of the type formed only of a tubular braided sheath, a substantially solid spiroid braid, or a tubular or spiroid braided sheath formed about a center core. In particular, the present invention is directed to improvements which make it possible to quickly mount and/or remove a yarn bobbin onto or from a yarn bobbin carrier with high efficiency and speed and to secure the bobbin to the carrier with a securing mechanism which is simple to operate, does not require a high level of dexterity, and which is not tiring or injurious to the muscles of the operator.

In the braider apparatus of the present invention a plurality of yarn bobbin carriers move about a main carrier support plate to dispense yarns toward a braiding zone where the yarns are braided together to form a final braided product, preferably a surgical suture. The preferred apparatus includes means for controlling tension on the yarns dispensed from the bobbins to form the braided suture product and to control the tension on the final braided product. Each yarn carrier includes a spindle onto which a novel molded bobbin having a central aperture is mounted for rotational movement relative to the spindle. Each bobbin has a number of radial segments engageable with a pawl on the carrier for selectively permitting rotation of the bobbin in response to yarn tension in order to control the dispensing of yarn from the bobbin.

According to the present invention there is provided apparatus for braiding yarns in accordance with claim 1 below.

In preferred embodiments of the invention, a bobbin top holder base is fixedly mounted relative to the yarn carrier adjacent the top of the yarn carrier spindle and, hence, adjacent to the top of a bobbin situated thereon.

The bobbin top holder base has hinge pins, and a bobbin top holder is hingedly mounted to the bobbin holder base at the hinge pins. The bobbin top holder has two longitudinally extending legs defining a slot therebetween and, more specifically, a spindle engaging recess having an inwardly projecting radiused section to engage a corresponding circumferential recess in the spindle adjacent the spindle tip. The bobbin holder legs are formed of a resilient plastic material which is sufficiently flexible to permit the legs to spread apart as the legs are forced over the spindle tip, and resiliently reassume a rest position disposed within the circumferential recess of the spindle to hold the bobbin on the spindle.

In use, the bobbin top holder first is disposed in an unlocked or open position rotated away from the spindle to permit mounting of a bobbin loaded with yarn onto the carrier. After the bobbin is mounted, the bobbin top holder is rotated into contact with the spindle tip with sufficient force to cause the bobbin top holder legs to spread apart and mount over the spindle, resiliently resuming a rest or contracted position disposed within the circumferential recess of the spindle tip, thereby securing the bobbin on the carrier. The braider apparatus thereafter is operated to form a final braided product, preferably a surgical suture. In order to remove an empty bobbin, sufficient upward force is exerted on the bobbin holder legs to cause the bobbin legs to spread apart, leave the spindle recess, and become disengaged from the spindle. The preferred bobbin holder is injection molded of an elastomeric plastic material which is sufficiently resilient to permit many cycles of bobbin mounting without failure of the bobbin top holder.

The bobbin holder of the invention is convenient to use and advantageously improves the efficiency of the preferred braider apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will be described herein with reference to the drawings, wherein:

Fig. 1 is a partial perspective view of a braider apparatus for braiding fine denier yarns constructed in accordance with the preferred embodiment of the invention;

Fig. 2 is a partial perspective view with parts separated for convenience of illustration, showing the carrier housing assembly and bobbin top holder contructed in accordance with the preferred embodiment of the invention;

Fig. 3 is an elevational view, partially in cross-section, of the preferred yarn tension control system of the invention;

Fig. 4 is a partial cross-sectional view taken along lines 4-4 of Fig. 1 illustrating a yarn carrier engaged with a carrier plate and the main support plate;

Fig. 5 is a perspective view of the preferred bobbin;

Fig. 6 is an elevation view of the bobbin, carrier, and bobbin top holder assembly constructed in accordance with the preferred embodiment of the invention, illustrating the bobbin in cross-section;

Fig. 7 is a top view of the bobbin top holder constructed in accordance with the preferred embodiment of the invention;

Fig. 8 is a cross-sectional view of the bobbin top holder taken along lines 8-8 of Fig. 7;

Fig. 9 is an elevation view of the spindle tip constructed in accordance with the preferred embodiment of the invention;

Fig. 10 is an elevational view of the bobbin top holder mounting base constructed in accordance with the preferred embodiment of the invention; and

Fig. 11 is a top plan view of the bobbin top holder mounting base of Fig. 10.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring initially to Fig. 1, there is illustrated an apparatus 10 for braiding sutures constructed according to the present invention. The apparatus 10 is supported on frame 12 which includes a horizontal support plate 14. Electrically powered motor 16 is arranged to drive the apparatus as will be described. In operation, motor 16 drives carrier plates 18 around main carrier support plate 20 along a predetermined path. A plurality of yarn bobbin carriers 22, only one of which is illustrated in Fig. 1 for simplicity, are mounted to carrier plates 18 and dispense yarns from yarn bobbins 24 (see Fig. 6) as the bobbins and carriers follow a predetermined path around the main carrier support plate. The apparatus illustrated in Fig. 1 is designed to drive the bobbin carriers in undulating paths in opposite directions around the main carrier plate in a known manner. However, alternate carrier path configurations also are contemplated, such as a spiral pattern in which all bobbin carriers move in the same direction around the main carrier plate. Spiral braiders, per se, are also known.

As illustrated in Fig. 1, yarns 3 dispensed from each bobbin carrier station are led to a braiding zone and formed into an elongated braided suture product. Tension on the braided suture product is controlled by driven tension rollers 26, 28 and take-up roller 30. Optionally, a core yarn bobbin 29 is mounted beneath support plate 14. The optional core yarn 31 maintained under tension is led through a core yarn tension detector 33 and a hollow tube 32 to the braiding zone, such that sheath yarns from the yarn carriers mounted on main carrier plate 20 are braided about the core yarn.

Referring now to Figs. 2-4 and 6 the yarn carrier system and yarn tensioning system is illustrated. Referring initially to Fig. 4, there is shown a cross-sectional view of the base of a yarn carrier 22 mounted to carrier support plate 18. Carrier 22 has downwardly extending connector shoes 38, 40 which extend into guide channels in the main carrier support plate 20. The connector shoes

traverse the respective guide channels as the yarn carrier is transferred between the respective carrier support plates 18. In an alternative contemplated arrangement the carriers are transported around the main carrier support plate in a spiral pattern.

As shown in Figs. 2-3, yarn bobbin carrier 22 has a carrier housing 42 with a spindle 44 extending vertically therefrom to receivably engage bobbin 24. A yarn guide support 46 also extends from carrier housing 42 in a direction substantially parallel to spindle 44, and is shown in Fig. 2 as a pair of rods 46A and 46B. A yarn dispensing guide eyelet 48, preferably made from a ceramic material, is fixed to one rod. A compensator eyelet 50, also preferably made from a ceramic material, slidably engages the other rod. Compensator eyelet 50 is connected via a compensator rod 52 to a compensator arm 54 for controlling the dispensing of yarn in response to tension exerted by the yarn on compensator arm 54 via compensator rod 52 and eyelet 50. Compensator arm 54 pivots about pivot pin 56 on carrier 22, as shown in Fig. 3. End portion 58 of compensator arm 54 is connected to compensator rod 52 while the opposite end portion 60 of pivot arm 54 engages pin 62 which is biased upwardly by a light coil spring 64. Pin 62 is disposed in and moves upwardly and downwardly in slot 63. Pin 62 is connected to pawl 66 arranged to float into and out of radial slots 68 on the lower surface of yarn bobbin 24. Pin 70 moves upwardly and downwardly in slot 72 in carrier housing 42 while traversing the moving arcuate slot 74 in compensator arm 54. Pin 62 is biased upwardly by spring 64 and, in turn, biases end portion 60 upward, pivotally rotating compensator arm 54 to urge arm end 58, rod 52 and compensator eyelet 50 downwardly. The upper ends of rods 46A and 46B are seated in and support a top holder support 76. Top holder support 76 has two substantially parallel vertical apertures 78, 80 configured to receive rods 46A, 46B, as by frictional engagement or by an adhesive disposed therebetween (see Fig. 11). Top holder support 76 includes a substantially horizontal yarn guide section 82 extending from support 76 and having a ceramic yarn guide eyelet 84 for guiding yarn dispensed from the bobbin toward the braiding zone. Top holder support 76 also has a pair of hinge pins 86, 88 (see Fig. 11) extending longitudinally therefrom in a direction substantially perpendicular to the spindle. Bobbin top holder 90 has a pair of hinge pin engaging legs 92, 94. Each leg has an enlarged hinge pin receiving section 96 having a hinge pin aperture 98 configured and dimensioned to receive hinge pins 86, 88. In this manner bobbin top holder 90 is mounted to top holder support 76 and is hingedly rotatable about the axis of hinge pins 86, 88.

Bobbin top holder 90 has a substantially planar section 100 extending from legs 92, 94 and a pair of spindle gripping legs 102, 104 defining therebetween a slot 106 and a spindle engaging recess 108. Fig. 7 is a top plan view of bobbin holder 90. Referring now to Fig. 8, a cross-sectional view of the bobbin holder taken along lines 8-8 of Fig. 7, it can be seen that spindle engaging recess 108 is configured with an outwardly tapered entrance wall 110, a substantially cylindrical barrel section 112, an inwardly projecting radiused section 114, and an outwardly tapered exit wall section 116. Preferably, entrance wall 110 defines an angle of about 10° to 20° relative to the axis of recess 108, and exit walls 116 define an included angle on the order of about 90°. The spindle engaging recess is symetrical about its vertical axis, except for slot region 106, and is identically configured in both legs 102, 104. As shown in Fig. 8, spindle engaging recess 108 is disposed in a region 140 of legs 102, 104 of greater thickness than the remaining portions of the legs in order to provide structural support surrounding the spindle engaging recess.

Referring again to Fig. 2, spindle 44 is provided with a bobbin holder engaging tip 118 configured to be disposed in spindle engaging recess 108 to secure bobbin top holder 90 to spindle 44 and, hence, bobbin 24 on spindle 44 (see Fig. 6). The preferred spindle tip configuration for engaging recess 108 is illustrated in Fig. 9. As shown in Fig. 9, spindle tip 118 has a spindle engaging shank 120 connected to a spindle tip body 122. Spindle tip body 122 has a substantially cylindrical proximal base 124, a spindle tip recess 126 defined by a pair of inclined walls 128, 130, and a substantially frusto-conical distal tip section 132. Distal tip section 132 and recess 126 may be joined by a substantially cylindrical transition section 134. Shank 120 is configured to be received in a hollow recess in spindle 44 to fixedly mount spindle tip 118 to spindle 44. Fixed mounting of tip 118 to spindle 44 may be accomplished by friction fit of shank 120 in the spindle recess, by providing an adhesive or combination of adhesive and friction between the shank and recess, or most preferably by providing mutually engageable threads on the shank and within the recess. In the preferred embodiment wherein threads 131 are provided, a slot 136 may be provided in distal tip 132 for engaging a tool, such as a screwdriver. Inclined walls 128, 130 preferably define an interior angle on the order of about 90°, and the walls of frusto-conical distal tip 132 preferably define an angle of about 20° relative to the tip axis. As in the case of spindle engaging recess 108, spindle tip 118 preferably is symetrical about the axis thereof.

Referring now to Fig. 5, the bobbin 24 preferred for use with the unique yarn dispensing system according to the present invention is shown. Bobbin 24 is integrally constructed of a lightweight material such as molded nylon or other plastic material. The bobbin includes a hollow cylindrical opening 140 configured to slidably receive spindle 44 with bobbin 24 being rotatable about the spindle (see Figs. 2 and 6).

In use, bobbin 24 is mounted onto spindle 44 with the bobbin top holder 90 in the open or unlocked position, as shown in Fig. 2. When mounted, radial slots 68 on bobbin 24 engage pawl 66 on carrier housing 42. Braiding yarn 3 is led from bobbin 24 through dispensing eyelet 48, compensator eyelet 50 and guide eyelet 84 and

upward to the braiding zone (also see Fig. 6). As will be explained in greater detail below, bobbin top holder 90 is rotated and locked into the position shown in Fig. 6 to hold bobbin 24 on spindle 44 during braiding.

During operation of the braiding apparatus, yarn is drawn upwardly by the braiding system. Yarn is dispensed from bobbin 24 until the tension on the yarn exceeds a predetermined value and draws compensator eyelet 50, rod 52 and compensator arm end portion 58 upward (see Figs. 2-3). The opposite end 60 of arm 54 depresses pin 62 against spring 64, causing pawl 66 to withdraw from slot 68 in the bobbin 24. Removal of pawl 66 from slot 68 permits bobbin 24 to rotate about spindle 44 to dispense more yarn. As further yarn is dispensed, the tension in the yarn is reduced below a predetermined value until the force of spring 64 again urges arm end portion 60 upward, rotatably pivoting arm 54 so that end portion 58, rod 52 and compensator eyelet 50 move downward. Pawl 66 simultaneously re-enters radial slot 68 in bobbin 24 to prevent further rotation of the bobbin until the cycle is repeated.

Preferably, fine denier multifilament yarns in the range of about 0.2 to 6.0 denier are dispensed from bobbin 24, with the tension of the yarn dispensed from bobbin 24 closely controlled within a precise range. The tension of the yarns is controlled within a precise range, particularly by selecting a spring 64 which is within a predetermined range of spring rates. Prior art braiders utilized a spring 64 of significantly greater spring rate than is contemplated herein due to the fact that braiding was accomplished with heavier braiding materials. In addition, in prior art braiders pin 70 was also arranged to be biased downwardly by a spring positioned centrally within spindle shaft 44. In the present apparatus the central spring has been eliminated and spring 64 has been selected to have a reduced spring rate in the range of from about 10.7 to 12.5 kg/m (0.6 to 0.7 pounds per inch). The standard spring on such braiders having a much higher spring rate on the order of about 16.07 to 17.89 kg/m (0.9 to about 1.0 pounds per inch). Reducing the spring rate reduces the tension force on the yarn necessary to cause pivot arm 54 to rotate and withdraw pawl 66 from slot 68, thereby permitting the bobbin to rotate and pay out additional yarn. The reduced spring rate accommodates the relatively lower tensile strength associated with yarns of aforementioned preferred denier range suitable for producing braided sutures. The production of such sutures is thus carefully and precisely controlled to accommodate the fine character, not only of the finished braided suture, but particularly of the yarn components thereof.

As previously noted, bobbin 24 is constructed of a lightweight moldable material such as nylon and defines a central axial opening 140 extending the length of the bobbin to receive the carrier housing spindle (see Figs. 2 and 6). With bobbin holder 90 disengaged from spindle 44 and rotated away from the spindle, such as in the substantially vertical bobbin holder position shown in Fig. 2, the bobbin may be mounted over the spindle with spindle 44 received within opening 140. Referring now to Figs. 2 and 6-9, after bobbin 24 is mounted over spindle 44 with pawl 66 seated in a bobbin slot 68, bobbin holder 90 is rotated about hinge pins 86, 88 until inwardly projecting radiused section 114 on each bobbin holder leg 102, 104 contact the angled surface of frusto-conical distal tip section 132. Preferably, contact between section 114 and tip section 132 occurs slightly before holder 90 reaches a position perpendicular to the axis of spindle 44. Exerting force on holder 90 to urge holder 90 against spindle tip 118 causes holder legs 102, 104 to be spread apart slightly by the camming action of frusto-conical tip 132 against section 114. Legs 102, 104 are spread apart until radiused section 114 is mounted over the distal tip section 132 and thereafter resiliently return to their rest position and become disposed within recess 126, as shown in Fig. 6. Thus, maximum spreading of legs 102, 104 occurs when radiused section 114 is disposed at cylindrical section 134 having substantially the same diameter as spindle tip base 124. In the locked or hold down position illustrated in Fig. 6, inwardly extending radiused section 114 is disposed in recess 126 with outwardly extending exit wall 116 juxtaposed to distal recess wall 130 and the lower radiused section 114 disposed adjacent proximal inclined recess wall 128. Cylindrical section 112 is disposed around spindle tip base 124. As shown in Fig. 6, the maximum diameter of tip 118 approximates the diameter of spindle 44 to facilitate mounting and removal of the bobbin onto and from the spindle.

Referring again to Fig. 6, with bobbin top holder 90 in the locked or hold down position engaging spindle tip 118 the relatively thick section 140 is disposed within the open area 142 on bobbin 24 radially within radial segments 138, with the remaining portions of legs 102, 104 disposed above and away from radial segments 138. In the event bobbin 24 rides up slightly, as may occur during yarn dispensing, thick section 140 abuts the flat central region on the end of the bobbin to prevent further upward movement of the bobbin. However, at no time does bobbin holder 90 engage radial segments 138 or otherwise obstruct rotational movement of the bobbin about spindle 44.

In order to remove a bobbin from the apparatus, i.e. after all the desired yarn has been dispensed from the bobbin during braiding, upward force is exerted on bobbin top holder 90, such as at the distal areas of legs 102, 104. This causes inclined wall 130 on tip 118 to cam against exit wall 116 of recess 126 and spread apart legs 102, 104, thereby causing inwardly projecting radiused section 114 to spread apart and become disengaged from recess 126. As radiused section 114 is removed from spindle 118 over frusto-conical distal tip 132, bobbin top holder legs 102, 104 resiliently return to their rest position wherein the separation distance of radiused sections 114 on each leg approximates the minimum diameter of spindle tip 118 within recess 126. At this point bobbin top holder 90 may be further rotated about hinge pins

86, 88 until holder 90 is rotated to a position such as shown in Fig. 2 out of the way to permit removal of the empty bobbin and/or placement of a new bobbin loaded with yarn to be dispensed for braiding.

The bobbin carrier and spindle may be made of metal, such as stainless steel, with top holder support rods 46A, 46B made from the same or different metal, e.g. aluminum, or a rigid plastic material. Ceramic eyelet 48 may be mounted to rod 46B by wrapping a metal wire around both the eyelet and the rod to fix the eyelet to a central region of the rod. Ceramic eyelet 50 may be mounted to rod 46A by similarly wrapping a metal wire around the eyelet and around rod 46A, to permit slidable movement of the wire relative to rod 46A. Preferably, compensator rod 52 is integrally formed of the same wire which connects ceramic eyelet 50 to rod 46A. This may be accomplished by wrapping the wire around eyelet 50, looping the wire around rod 46A, and extending the wire to engage compensator arm end section 58, as illustrated in Figs. 2-3. Top holder support 76 preferably is made of a rigid plastic material, such as nylon. Top holder 90 is made of a plastic material which is sufficiently flexible and resilient to deform and permit legs 102, 104 to repeatedly be spread apart and mounted over spindle tip 118 through multiple cycles, such as an elastomeric nylon material. Advantageously, both top holder support 76 and bobbin top holder 90 may be injection molded at relatively modest cost. Spindle tip 118 should be made of a rigid metal material, such as a zinc coated steel.

As will be appreciated, the bobbin top holder of the present invention facilitates quick and easy placement and removal of a bobbin relative to the spindle and bobbin carrier. Advantageously, the top holder of the invention does not require any pinching or gripping action by the user, such as to unscrew a prior bobbin holder, thereby minimizing the effort which must be exerted by the user to engage or release the bobbin top holder and reducing the time required to change bobbins on the carrier. These reductions in exerted energy and time contribute to increased efficiency in the braiding operation, which efficiencies become considerable in operating a large number of braiding apparatus each having multiple yarn carriers.

It will be readily appreciated that the features of the present invention as described hereinabove make it possible to produce a fine denier braid capable of application as a suture for surgery. More particularly, the braiding apparatus is well suited for high speed production of consistently high quality final braided suture products having an overall suture denier ranging from as low as about 50 denier to as large as about 4,000 denier. Core yarns will have a preferred denier of from as low as about 20 denier to as high as about 2,400 denier, and sheath yarns will have a denier of from as low as about 0.2 denier to as high as about 6.0 denier.

Claims

1. Apparatus for braiding yarns comprising:

   a frame

   a plurality of yarn bobbin carriers (22) movably mounted on said frame, each said yarn bobbin carrier supporting a bobbin for dispensing yarn toward a braiding zone, each said yarn bobbin carrier having an upstanding spindle (44) and bobbin securement support means;

   bobbin hold down means (90) attached to said support means by hinge formations (96, 98) which define a pivotal axis transverse to the length of the spindle (44) and movable between a position of engagement with said spindle to hold down said bobbin on said yarn bobbin carrier, and a release position to allow the bobbin to be lifted from the spindle, movement from the engaged to the release position being accomplished by an upward force on the hold down means (90),

   the apparatus being characterised in that:

   said bobbin hold down means comprises a planar base (100) with two resilient legs (102, 104) extending longitudinally from said hinge formations (96, 98) to an opening (108) between the legs (102, 104) for receiving said spindle (44), said spindle having a recess (108) adjacent its tip (118), so that the legs (102, 104) spread resiliently over the tip (118) then reassume a rest position in the recess (108) to lock the spindle against upward movement; and

   the hold down means is so constructed that at no time does it obstruct rotational movement of the bobbin about the spindle (44).

2. Apparatus as claimed in claim 1 wherein said planar base (100) is constructed of plastics material.

3. Apparatus as claimed in claim 1 or 2 wherein said tip (118) has a frusto-conical region (132).

4. Apparatus as claimed in claim 6, 7 or 8 wherein said recess (108) is defined by inclined distal (130) and proximal (128) surfaces.

5. Apparatus as claimed in claim 4 wherein said distal and proximal inclined surfaces define an included angle of about 90°.

Patentansprüche

1. Vorrichtung zum Flechten von Garnen mit: einem Rahmen;

   mehreren Garnspulenträgern (22), die bewegbar an dem Rahmen montiert sind, wobei jeder Garnspulenträger eine Spule zur Abgabe von Garn zu einer Flechtzone trägt, wobei jeder Garnspulenträger eine hochstehende Spindel (44) und eine Spulenbefestigungslagereinrichtung aufweist;
   einer Spulenniederhalteeinrichtung (90), die an der Lagereinrichtung durch Gelenkanordnungen (96, 98) befestigt ist, die eine Drehachse quer zur Länge der Spindel (44) festlegen und die zwischen einer Eingriffsposition mit der Spindel, um die Spule an dem Garnspulenträger niederzuhalten, und einer Freigabeposition bewegbar ist, um zu ermöglichen, daß die Spule von der Spindel abgehoben wird, wobei die Bewegung von der Eingriffsposition zu der Freigabeposition durch eine nach oben gerichtete Kraft auf die Niederhalteeinrichtung (90) bewirkt wird,
   dadurch **gekennzeichnet**, daß:
   die Spulenniederhalteeinrichtung eine planare Basis (100) mit zwei elastischen Schenkeln (102, 104) aufweist, die sich in Längsrichtung von den Gelenkanordnungen (96, 98) zu einer Öffnung (108) zwischen den Schenkeln (102, 104) erstrecken, um die Spindel (44) aufzunehmen, wobei die Spindel eine Aussparung (108) neben ihrer Spitze (118) aufweist, so daß die Schenkel (102, 104), die elastisch über die Spitze (118) gespreizt worden sind, anschließend wieder eine Ruheposition in der Aussparung (108) einnehmen, um die Spindel gegen eine Nach-oben-Bewegung zu verriegeln; und die Niederhalteeinrichtung derart konstruiert ist, daß diese zu keinem Zeitpunkt eine Drehbewegung der Spule um die Spindel (44) behindert.

2. Vorrichtung nach Anspruch 1,
   wobei die planare Basis (100) aus Kunststoffmaterial hergestellt ist.

3. Vorrichtung nach Anspruch 1 oder 2,
   wobei die Spitze (118) einen kegelstumpfförmigen Bereich (132) aufweist.

4. Vorrichtung nach Anspruch 6, 7 oder 8, wobei die Aussparung (108) durch geneigte distale (130) und proximale (128) Flächen festgelegt ist.

5. Vorrichtung nach Anspruch 4,
   wobei die distalen und proximalen geneigten Flächen einen eingeschlossenen Winkel von ca. 90° festlegen.

Revendications

1. Appareil pour tresser des fils, comprenant :

   un bâti,
   une pluralité de porte-bobine de fil (22) montée mobilement sur ledit bâti, chaque porte-bobine de fil précité supportant une bobine pour délivrer du fil vers une zone de tressage, chaque porte-bobine de fil précité ayant une broche verticale (44) et des moyens de support de fixation de bobine;
   des moyens (90) de maintien de bobine vers le bas, attachés auxdits moyens de support par des éléments formant charnière (96, 98) qui définissent un axe de pivotement transversal à la longueur de la broche (44) et mobiles entre une position de mise en prise avec ladite broche pour maintenir ladite bobine vers le bas sur ledit porte-bobine de fil et une position de libération pour permettre à la bobine d'être soulevée de la broche, le mouvement depuis la position de mise en prise à la position de libération étant accompli par une force ascendante sur le moyen (90) de maintien vers le bas,
   l'appareil étant caractérisé en ce que :
   ledit moyen de maintien de bobine vers le bas comprend une base plane (100) à deux branches élastiques (102, 104) s'étendant longitudinalement depuis lesdits éléments formant charnière (96, 98) jusqu'à une ouverture (108) entre les deux branches (102, 104) pour recevoir ladite broche (44), ladite broche ayant un évidement (108) adjacent à son bout (118), de façon que les branches (102, 104) s'écartent élastiquement par-dessus le bout (118) et réoccupent ensuite une position de repos dans l'évidement (108) pour verrouiller la broche contre un mouvement asendant; et
   le moyen de maintien vers le bas est construit de telle façon qu'à aucun moment il ne gêne le mouvement rotatif de la bobine autour de la broche (44).

2. Appareil tel que revendiqué dans la revendication 1, dans lequel ladite base plane (100) est construite en matière plastique.

3. Appareil tel que revendiqué dans la revendication 1 ou 2, dans lequel ledit bout (118) a une région tronconique (132).

4. Appareil tel que revendiqué dans la revendication 6, 7 ou 8, dans lequel ledit évidement (108) est défini par des surfaces inclinées distale (130) et proximale

(128).

5. Appareil tel que revendiqué dans la revendication 4, dans lequel lesdites surfaces inclinées distale et proximale définissent un angle inclus d'environ 90°.

Fig.1

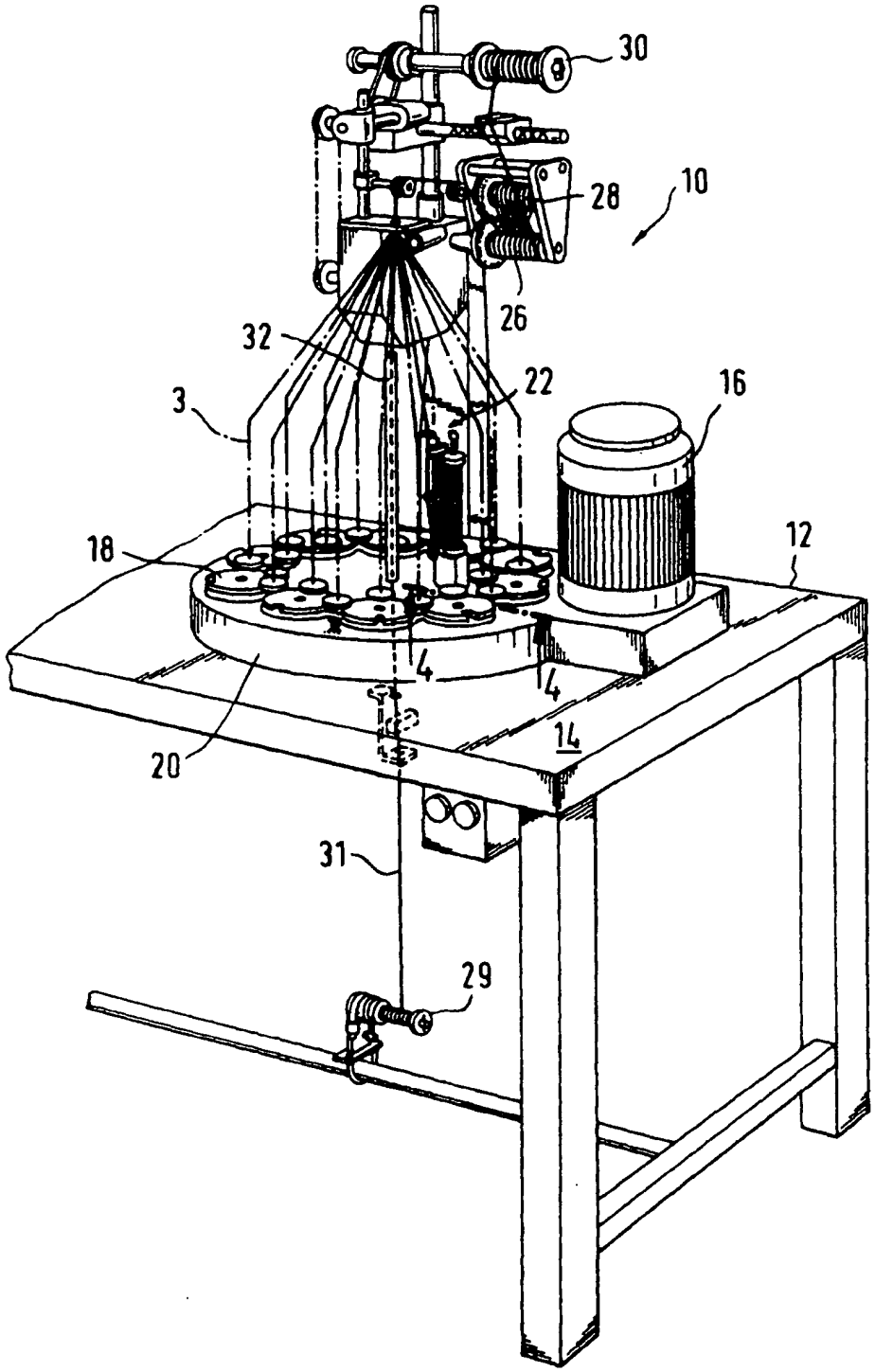

Fig.2

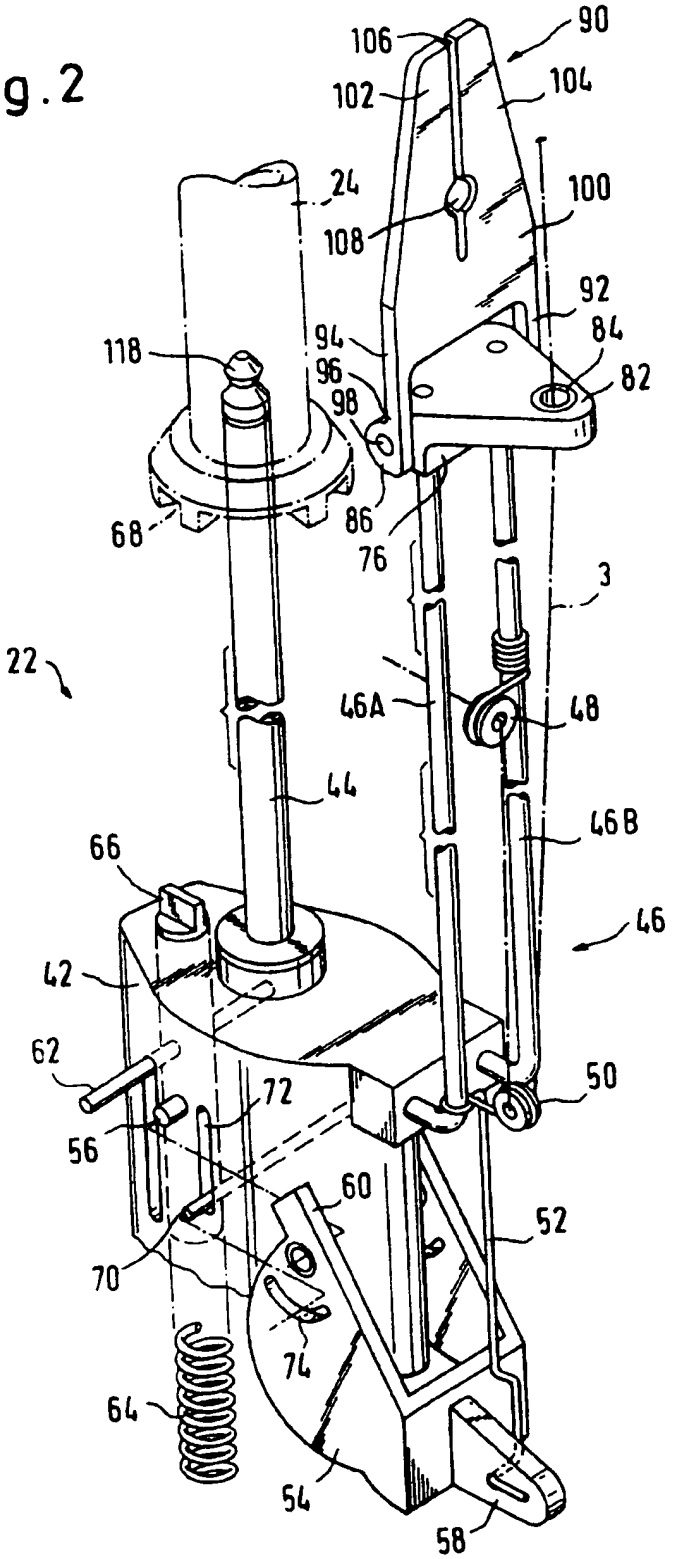
90
106
102
104
24
100
108
92
84
118
94
96
82
98
68
86
76
3
22
46A
48
44
46B
66
46
42
62
50
72
56
60
52
70
74
64
54
58

Fig.4

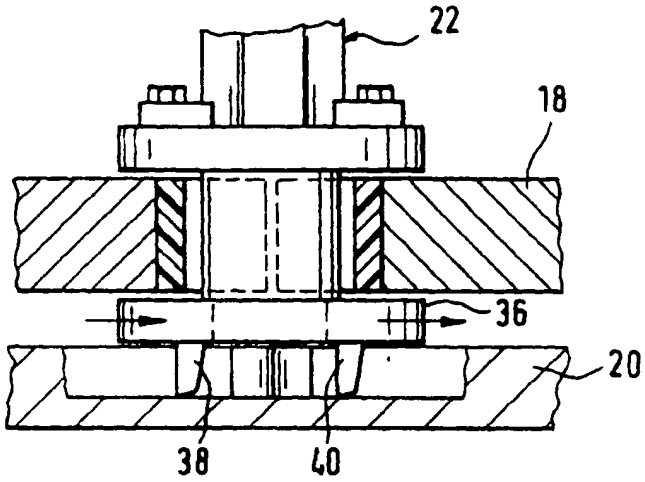

Fig.3

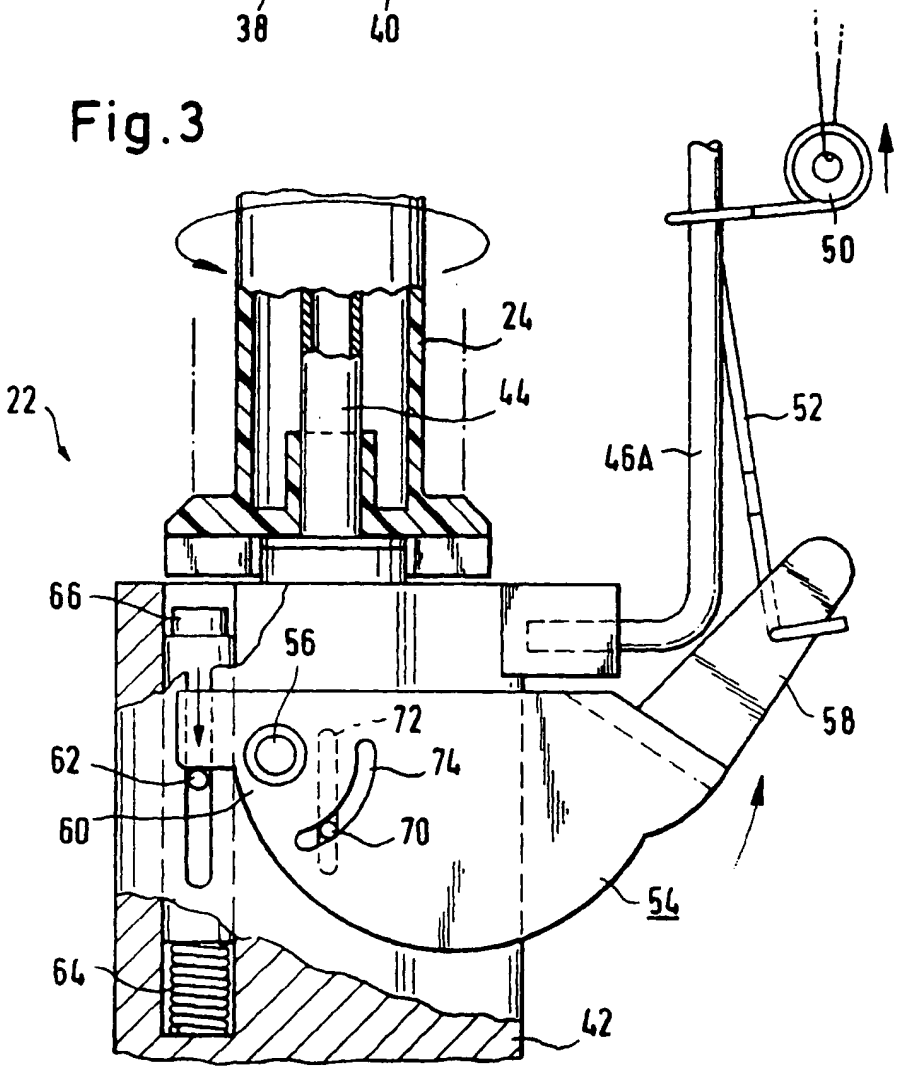

Fig.5

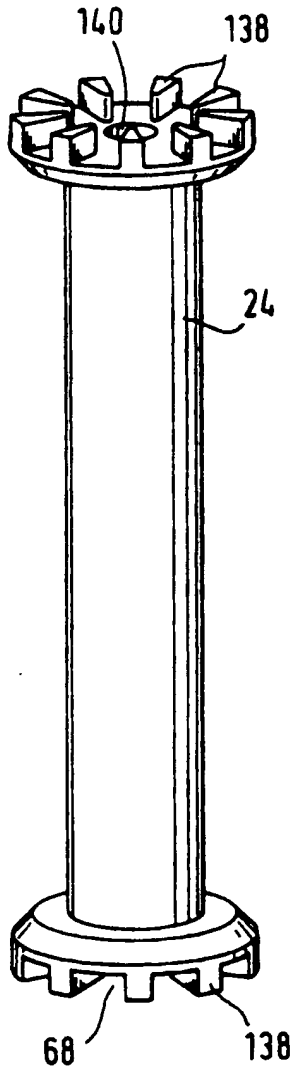

Fig.6

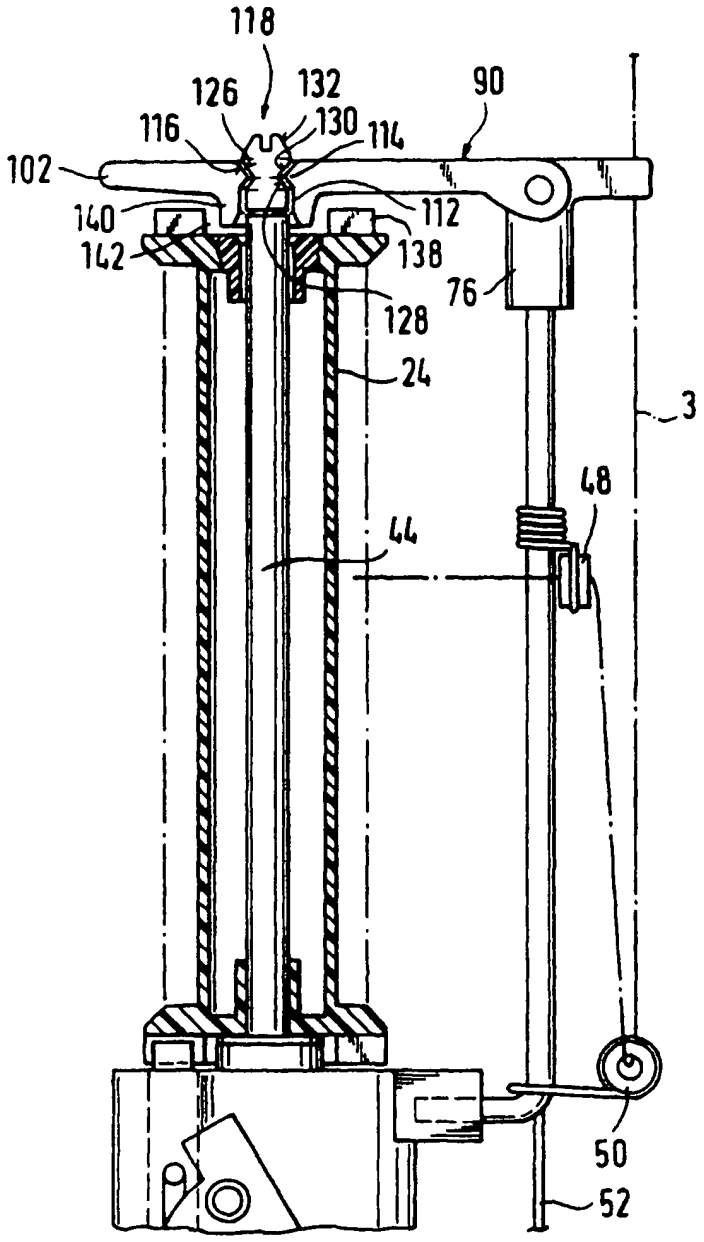
118
126
132
90
116
130
114
102
140
112
142
138
76
128
24
3
48
44
50
52

Fig.8

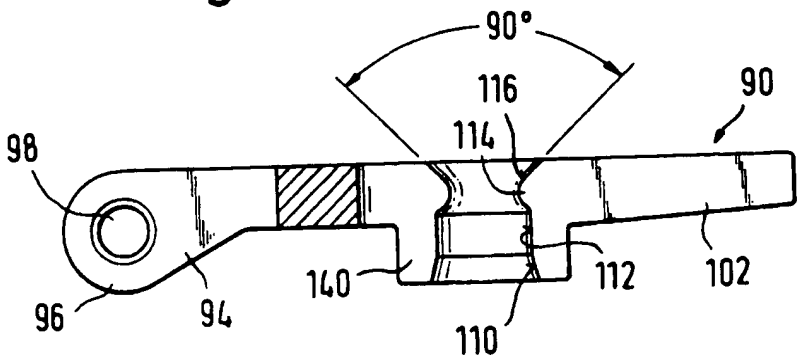
90°
116
114
90
98
140
112
102
96
94
110

Fig.7

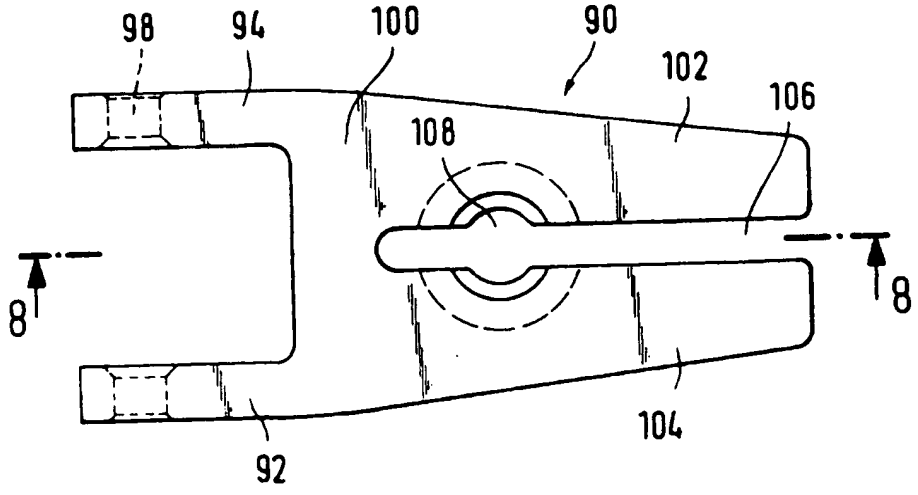
98
94
100
90
102
106
108
8
8
104
92

Fig.9

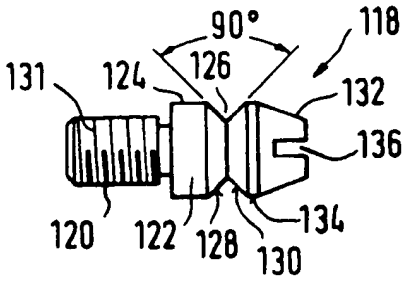

Fig.10

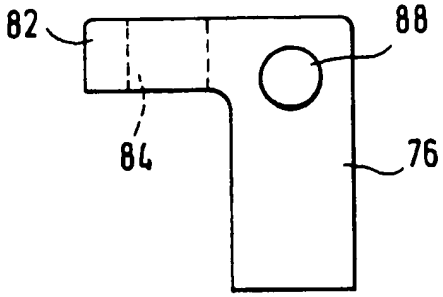

Fig.11